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	PDS-PFM THERMAL VACUUM TEST REPORT		Ediz.: <b>1</b> Issue:	Data: <b>SEPT 2009</b> Date:
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### ANNEX 3: PVS COLLECTION

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## PROCEDURE VARIATION SHEET ref. N°: 01

Procedure Ref.: PDS-PR-CGS-012

Page Revised: 12,13

Paragraph Revised: 6.3

Description of Change: **TEFLON TAPE PROTECTION NOT REMOVED**

Step 1.3 of the Step By Step procedure said:

Remove the protective tape from the silver Teflon tape on the top rear cover

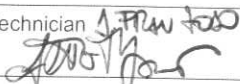

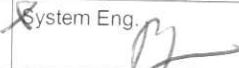
This step has not been performed.

Reason for Change:

The upper side of the PDS shall be covered with MLI, therefore there is no need of high emissivity/low absorptivity optical properties. This step therefore does not affect the prosecution of the test and the test performance in any way.

On the contrary, it is important to keep the protective layer in order to preserve the optical properties of the tape until the last phases of the integration on AMS-02

### CONCURRENCE

Technician  Date <b>25/08</b>	QA  Date <b>25/08</b>	System Eng.  Date <b>25/08</b>	Customer Date
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CARLO GAVAZZI SPACE SpA

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## PROCEDURE VARIATION SHEET ref. N°: 02

Procedure Ref.: PDS-PR-CGS-012

Page Revised: 12,13

Paragraph Revised: 6.3

Description of Change: **SENSOR NUMBERING**

Numbering of PT100 thermal sensors has been updated as follows:

old number → New number

PDS17 → PDS18

PDS18 → PDS19

PDS19 → PDS20

PDS20 → PDS21

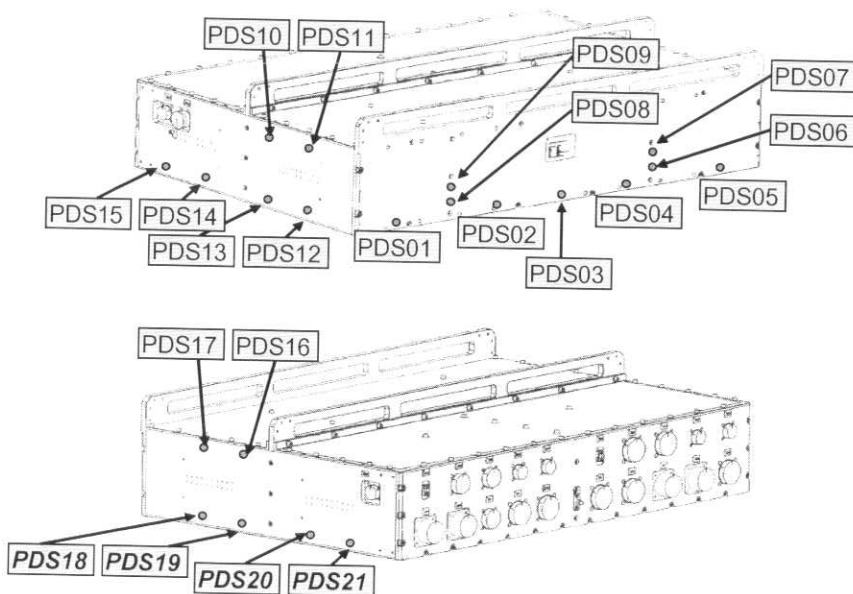
PDS21 → PDS22

PDS22 → PDS23

PDS23 → PDS24

PDS24 → PDS25

The new figures are given below:




Reason for Change:

Fig 6-8 and Fig 6-9 are wrong because of the presence of two different sensors, both numbered PDS17.

### CONCURRENCE

Technician <i>A. F. [signature]</i>	QA <i>[signature]</i>	System Eng. <i>[signature]</i>	Customer
Date <i>25/8</i>	Date <i>25/8</i>	Date <i>25/8</i>	Date

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## PROCEDURE VARIATION SHEET ref. N°: 03

Procedure Ref.: PDS-PR-CGS-012

Page Revised: 31

Paragraph Revised: step 1.6

Description of Change: **PROTECTIVE CAPS NOT REMOVED**

Step 1.3 of the Step By Step procedure said:

Remove dust caps and install savers on all PDS connectors

This step has been partially performed: dust caps were removed, but connector savers have not been installed.

Reason for Change:

Since only one mating/de-mating is foreseen during the entire test duration, no savers are needed.

### CONCURRENCE

Technician <b>A. Frattoloso</b>	QA <b>[Signature]</b>	System Eng. <b>[Signature]</b>	Customer
Date <b>25/8</b>	Date <b>25/8</b>	Date <b>25/8</b>	Date



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## PROCEDURE VARIATION SHEET ref. N°: 04

Procedure Ref.: PDS-PR-CGS-012

Page Revised: N.A

Paragraph Revised: N.A.

Description of Change: Neglecting of sensor PDS01

Sensor PDS 01, located on the front panel at lower left, was found broken after the test setup completion.

To avoid dismounting the test setup and considering that the sensor PDS01 is neither a TRP nor mounted in a critical area and PDS12, PDS02 and sensor nr. 29 of the interface plate are close by it has been decided to go on with the test without changing the sensor PDS01.


Reason for Change: Sensor PDS01 defect

The Sensor PDS01 was successfully tested after mounting on PDS, prior to the test setup inside the vacuum chamber;

After completion of the test setup (mounting PDS on the cold plate, rooting the harness and attaching MLI) a second test was performed, which revealed that the sensor PDS01 is not functioning.

### CONCURRENCE

Technician <b>A. FRANTO</b>	QA	System Eng.		Customer
Date <b>25/8</b>	Date <b>25/8</b>	Date <b>25/8</b>		Date

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## PROCEDURE VARIATION SHEET ref. N°: 05

Procedure Ref.: PDS-PR-CGS-012

Page Revised: 33 and following

Paragraph Revised: step 2.4 and similar following ones

Description of Change: **STABILIZATION CRITERION**

Procedure asked to use – as stabilization criterions – 2°C/10 minutes.

This value is not in agreement with the much stricter value mentioned at page 17, which is 1.0°C/hour.

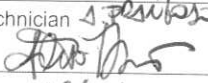

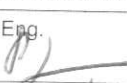
Therefore, all stabilization criteria shall be corrected from 2°C/10min to 1.0°C/hour (several steps starting from 2.4 at page 33 to the end of the procedure).

Reason for Change:

Updated Stabilization criterion is stricter, and is of common use in typical TVTests.

On the contrary, 2°C/10min is not considered a stabilized condition, and is a clerical error during the step-by-step table filling.

### CONCURRENCE

Technician <i>A. Pizzuto</i> 	QA 	System Eng. 	Customer
Date <b>26/8/03</b>	Date <b>26/8</b>	Date <b>26/8</b>	Date



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of **10****PROCEDURE VARIATION SHEET ref. N°: 06**

Procedure Ref.: PDS-PR-CGS-012

Page Revised:

Paragraph Revised: step

Description of Change: **BUS-A and BUS-B similar test phases grouping**

Some parts of the procedure relative to bus-B have been anticipated and performed in parallel or in sequence to bus-A similar parts, according to the list below:

1. steps 2.29 (bypass of bus-A interlock activation) was followed by step 2.39 (the same for bus-B).
2. After the performance of step 2.24 (quick test of bus-A after switch ON at -25°C), step 2.41 has been performed (quick test of bus-B after switch ON at -25°C). In fact, after the test of the bus-A, the TRP of bus-B was still in the -25°C +0°C/-3°C range: heating of the bus-A part did not affect temperatures of the bus-B area in a significant way.
3. Step 2.26 (removal of bypass of thermostats of bus-A) was followed by step 2.43 (the same for bus B)
4. Steps 2.28 and 2.29 (lines activation and research for thermostat closing temperature) was performed in parallel with the equivalent bus-B step 2.45 and 2.46


As a consequence, the following steps of the procedure are no longer applicable because already performed in conjunction with bus-A equivalent steps: 2.40, 2.42, 2.44.

**Reason for Change:**

The combination of the steps allowed the exploitation of the commonalities between the two phases, thus avoiding the doubling of several time consuming steps of stabilization and of set-point change.  
In this way the test duration has been reduced, while keeping the same amount of tests, in the same conditions as they were planned in the original procedure, but in a different chronological order.

**CONCURRENCE**

Technician <b>A. Mantolo</b>	QA	System Eng.		Customer
Date <b>22/8</b>	Date <b>22/8</b>	Date <b>22/8</b>		Date

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## PROCEDURE VARIATION SHEET ref. N°: 07

Procedure Ref.: PDS-PR-CGS-012	Page Revised: 35	Paragraph Revised: step 2.30
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Description of Change: **POWER CONSUMPTION IN COLD CASES**

Step 2.30 requires to perform stabilization at minimum operational temperature with the PDS in NOMINAL mode.

Step has been changed, so that all the cold plateaus (the one of cycle#1 of step 2.30, and the cold stabilizations of the 4 operational cycles) shall be performed at DEFAULT ON configuration power:

- ESEM3-B lines 1,2,3,6 ON and loaded,
- JPD-N line ON without load,
- JPD-R ON without load.

The same stands for step 2.47, the equivalent for bus-B.

Reason for Change:


The reason is two-fold:

1. the DEFAULT ON power dissipation in the cold case is a real low-power scenario (with PDS at -25°C the AMS as well is cold implying the thermostats on the heaters line activated while the thermostats on the JPD lines de-activated), which is likely to happen during the mission life; testing of the unit at the suggested low power and low temperature is more demanding (since the lowest self-heating is superimposed to the lowest temperatures). This configuration has been considered much more representative of a cold case..
2. The reduced power dissipation can be more easily managed by the chamber, which has not to be used in its extreme conditions, too close to the low temperature limit. This allows a better control of temperature during power transients, and a sensible reduction of the duration of the cycles, since it will be possible to speed up the transients by setting the chamber at a temperature set point lower than the target equilibrium value.

### CONCURRENCE

Technician <i>A. Pavesi</i>	QA <i>Rj</i>	System Eng. <i>Dj</i>		Customer
Date <i>28/8/08</i>	Date <i>29/9</i>	Date <i>29/9</i>		Date



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## PROCEDURE VARIATION SHEET    ref. N°: 08

Procedure Ref.: PDS-PR-CGS-012

Page Revised:

Paragraph Revised: step

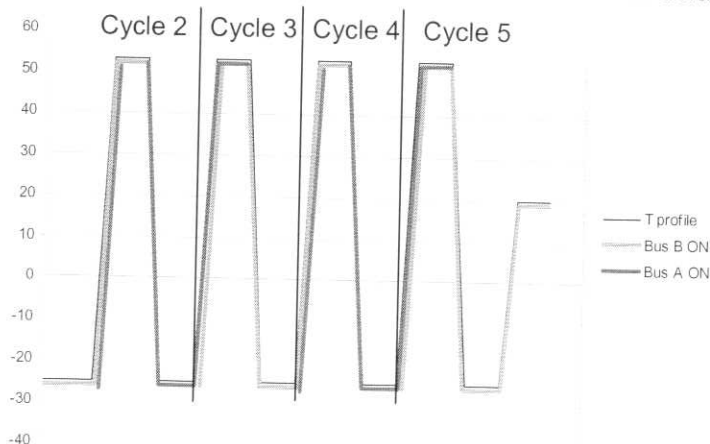
Description of Change:    **BUS SWITCHING DURING OPERATIONAL CYCLES**

The procedure asked to perform:

- cycles 2 and 4 with bus B in nominal mode and bus A off,
- cycles 3 and 5 with bus B in nominal mode and bus A off.

The cycles are to be performed as follows:

- ramp-up of cycles 2 and 4 with bus A on in default-on mode and B at nominal-high power
- hot stabilization of cycles 2 and 4 with bus B on at nominal-high power, bus A off
- ramp-down of cycles 2 and 4 with bus A at minimum power mode and bus B off
- cold stabilization of cycles 2 and 4 with bus A at default-on mode, bus B off
- ramp-up of cycles 3 and 5 with bus B on in default-on mode and A at nominal-high power
- hot stabilization of cycles 3 and 5 with bus A on at nominal-high power, bus B off
- ramp-down of cycles 3 and 5 with bus B at minimum power mode, bus A off
- cold stabilization of cycles 3 and 5 with bus B at default-on mode, bus A off



Reason for Change:

- 1- the switching on of both sides in the ramp-up phases served to speed up the transient phase and warm up the unit more efficiently. In any case the previously-off bus could be switched ON only after its TRP was above the - 25°C lower limit.
- 2- the setting of the side to be tested at following cold plateau in minimum power mode mode for the ramp-down had the similar purpose to speed up the cooling of the unit and reduce the time of the transients.
- 3- the change from one side to the other at the end of the hot plateaus had the purpose of starting the ramp-down phase with a colder TRP, thus shortening the duration of the transients.

It has to be noted that in any case each side has been tested for 1+1 cycles consecutively, just with a different order of switching events. Each bus has experienced in addition to the nominal procedure two switch-on during the ramp-up of the other side thermal cycles.

### CONCURRENCE

Technician <i>A. FANTONI</i>	QA <i>[Signature]</i>	<input checked="" type="checkbox"/> System Eng. <i>[Signature]</i>	Customer
Date <i>30/8/08</i>	Date <i>30/8</i>	Date <i>30/8</i>	Date



CARLO GAVAZZI SPACE SpA

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Procedure Ref.: PDS-PR-CGS-012

Page Revised:

Paragraph Revised: step

Description of Change: **THERMOSTAT OPENING INVESTIGATION**


At the end of the cold plateau of last cycle (cycle number 5), prior to the step 7.1, perform the following steps:

STEP n°	TEST SEQUENCE	EXPECTED VALUE	MEASURED VALUE	REMARKS
6.7	Increase chamber temperature in order to obtain on both TRP a temperature higher than -18°C.	$T_{TRP} > -18^{\circ}\text{C}$		
6.8	switch OFF the PDS-busB input voltage	OFF		
6.9	remove bypasses of "thermal interlock" thermostats on J300 test box, from both unit sides	Removed		
6.10	switch ON both sides, at minimum power	ON		
6.11	decrease chamber temperature to gradually lower TRP temperature and to force thermostats opening	$T_{TRP}$ decreasing		
6.12	record TRP temperature and internal thermistor reading at the moment of thermostat opening (PDS busses off)	$T = -27.2 \pm 1.7^{\circ}\text{C}$		
6.13	set chamber temperature at -25°C	$T_{chamber} = -25^{\circ}\text{C}$		

Reason for Change:

To verify that the internal thermostats are opening at their nominal temperatures ( $-27.2^{\circ}\text{C} \pm 1.7^{\circ}\text{C}$ ).**CONCURRENCE**

Technician <i>A. Frazzetta</i>	QA <i>[Signature]</i>	System Eng. <i>[Signature]</i>	Customer
Date <i>9/9/09</i>	Date <i>2/9</i>	Date <i>2/9</i>	Date

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Procedure Ref.: PDS-PR-CGS-012

Page Revised:

Paragraph Revised: step

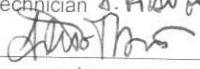


Description of Change:      **ADDITIONAL INVESTIGATION AT +50°C TRP**

At the end of the hot plateau of the last (fifth) cycle, an additional stabilization has been attained at a TRP temperature of 50°C, in order to investigate on the PB2 #3 [side A] board switching off observed during the same cycle hot plateau (see NCR-PDS-CGS-C-139)

Reason for Change:

See NCR-PDS-CGS-C-139.

### CONCURRENCE

Technician <i>A. Pavesi</i> 	QA 	System Eng. 	Customer
Date <b>1/9/08</b>	Date <b>1/9</b>	Date <b>1/9</b>	Date